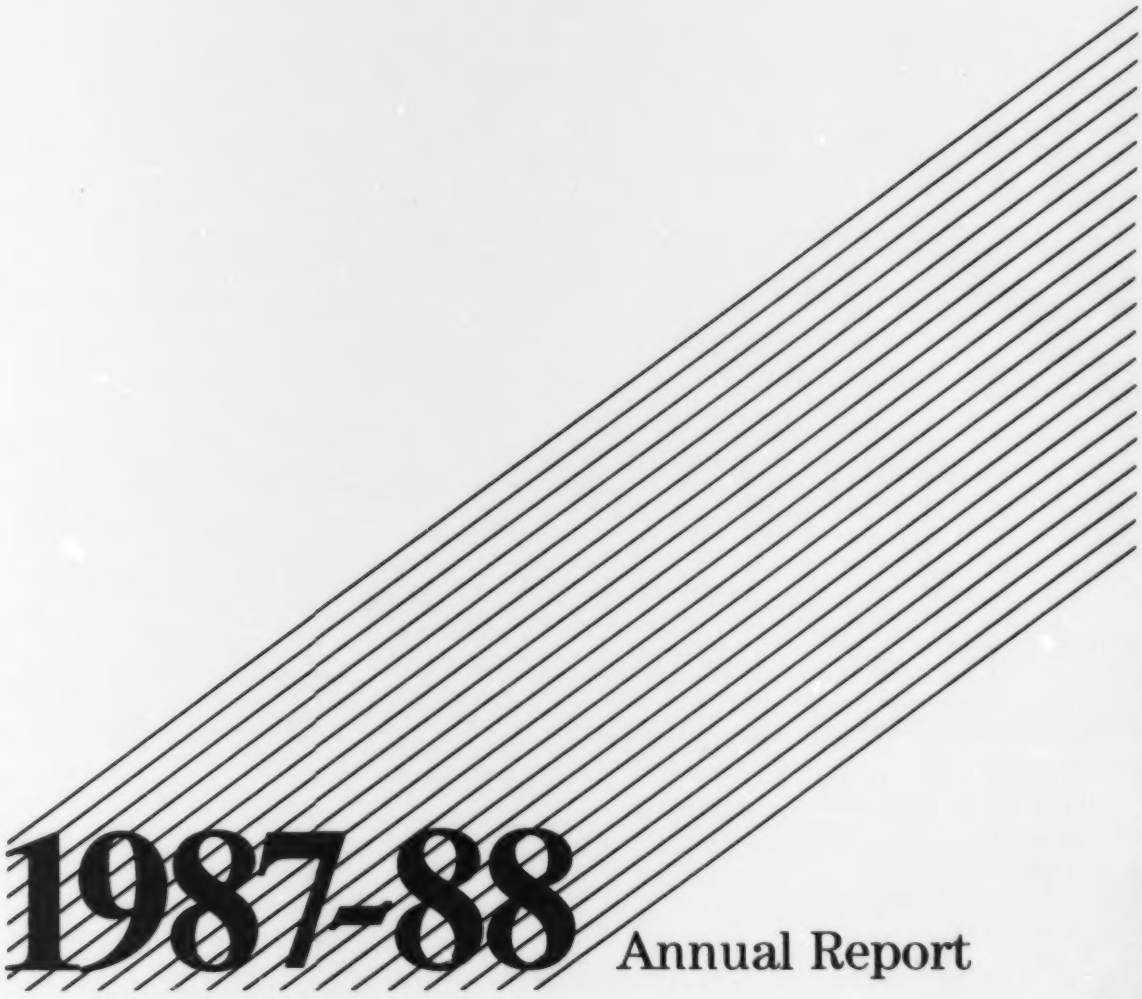
Alberta Technology, Research and Telecommunications



1987-88 Annual Report

Alberta

TECHNOLOGY, RESEARCH AND TELECOMMUNICATIONS
AND GOVERNMENT HOUSE LEADER

Office of the Minister

404 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/422-5982 Fax 403/420-0467

The Honourable Dr. David J. Carter
Speaker of the Legislative Assembly of Alberta
325 Legislature Building
Edmonton, Alberta
T5K 2B6

Dear Sir:

I have the honour to submit the Annual Report for the Department of Technology, Research and Telecommunications for the year ending March 31, 1988.

Respectfully submitted,

Leslie G. Young
Minister

Alberta
TECHNOLOGY, RESEARCH
AND TELECOMMUNICATIONS

Office of the Deputy Minister

12th Floor, Pacific Plaza, 10909 Jasper Avenue, Edmonton, Alberta T5J 3M8

403/422-0567 Direct Line 403/422-0063
Telefax 403/420-1474 Telex 037-42687

The Honourable Leslie G. Young
Minister of Technology, Research and Telecommunications
404 Legislature Building
Edmonton, Alberta
T5K 2B6

Dear Mr. Young:

I have the honour to submit a report covering activities of the Department of Technology, Research and Telecommunications for the fiscal year ending March 31, 1988.

Respectfully submitted,

Ken H. G. Broadfoot
Deputy Minister

Minister's Message

A Sense of Accomplishment

Slightly more than two years ago, Premier Don Getty announced the establishment of the Department of Technology, Research and Telecommunications as part of a renewed and enhanced commitment to economic diversification. Alberta has made great strides in establishing and nurturing a viable technology industry.

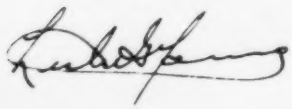
The formation of the Department provides a focus for the development of advanced technologies and supports Albertans in their endeavours to become leading edge competitors in research and advanced technology development.

The Alberta Government, through cooperation and collaboration with the province's universities, the private sector and the Alberta Research Council, has identified new opportunities and aggressively pursued the research, development and commercialization of various types of technologies. As well, a solid infrastructure of research and development institutes, such as the Alberta Heritage Foundation for Medical Research; the Alberta Microelectronic Centre; the Biotechnology Pilot Plant at the Alberta Research Council; the Alberta Telecommunications Research Centre; the Alberta LASER institute; and others, have been established.

The Department has assisted the private sector in the development and commercialization of new technologies and products. Through grants, loans and investment, the Department has acted as a catalyst and supporter of numerous projects. These projects have tremendous potential for the future, while generating new jobs and economic activity today.

Through the Department's activities and public awareness program, there is a growing recognition within Alberta of the importance of advanced technologies to our economic well-being. And elsewhere in Canada and the world, there is an increasing acknowledgement of Alberta as a leading centre of research and development in advanced technologies.

Alberta must continue to be alert to new opportunities, and be willing to take the initiative in order to capitalize on them. With the continued cooperation and support of public institutions and the private sector, I am confident Alberta will meet the many challenges of the future.



Leslie G. Young
Minister

Mission Statement

The Department will promote the research, development and commercialization of science and technology, the application of new technology to existing and new industries, and the creation of new employment opportunities arising out of technology development within Alberta. It will ensure that public policy supports a high quality, affordable communications system for all Albertans, and work to create an awareness and understanding among Albertans of the economic, social and environmental benefits of advanced technologies.

The Minister is responsible to the Legislature for :

- the Alberta Research Council;
- Alberta Government Telephones;
- Alberta Educational Communications Corporation (ACCESS NETWORK); and
- the Alberta Heritage Foundation for Medical Research;

and liaises with the:

- Alberta Oil Sands Technology and Research Authority;
- Alberta Environmental Centre;
- Agricultural Research Council of Alberta;
- Alberta Foundation for Nursing Research; and

other provincial organizations undertaking research in the engineering, medical and natural sciences fields.

Department Goals

The goals of the Department are to:

- identify the priority advanced technology areas that will contribute to the growth and diversification of the Alberta economy;
- direct funds/resources for research, development and commercialization in those priority areas;
- ensure that resources available for technology development are applied in order to create favourable conditions for growth;
- commercialize technology successfully to maximize employment opportunities in Alberta and to enhance the competitive position of Alberta entrepreneurs;
- encourage a technology culture within the province which prompts broad participation by Albertans in the research, development, commercialization and utilization of advanced technologies;
- work with the federal and other provincial governments in defining and implementing the National Science Policy;
- emphasize priority advanced technology areas in conjunction with other provincial agencies, government jurisdictions, research institutes and industry to create cooperative initiatives aimed at exploiting the commercial benefits of technology development; and
- develop provincial policies and influence federal policies to ensure a high-quality, affordable communications system for all Albertans.

Department Strategies

The broad strategies of the Department include:

- developing "home grown" technology-intensive companies through the provision of start-up assistance, management and marketing support;
- identifying and establishing a "building block" infrastructure which will bridge the research interests of business, research institutions and universities;
- stimulating the commercialization of research and development through cooperative arrangements and programs applicable to business, universities, the general public and government laboratories;
- streamlining access to government programs which enhance the commercialization of science and technology;
- encouraging traditional industries to become more competitive and productive through advanced technologies, such as advanced manufacturing;
- working closely with the federal government in science and technology areas, with particular emphasis on obtaining an equitable share of federal science and technology expenditures;
- developing manpower training programs in conjunction with appropriate agencies to ensure that the Province can meet the human resources requirements for advanced technology development;
- improving the availability of risk capital;
- attracting investment by international technology companies which will result in the transfer of technology to Alberta in our priority development areas;
- establishing a communications program to build public understanding of Alberta's technology development opportunities and scientific achievements.

Technology Commercialization Division

The Department has identified a number of advanced technology sectors in which Alberta may be competitive on a worldwide basis. These are:

- **electronics and microelectronics;**
- **computers and software;**
- **telecommunications;**
- **medical and biological services;**
- **advanced materials and processes; and**
- **advanced manufacturing technologies.**

The Technology Commercialization Division is responsible for promoting these areas and assisting Alberta companies to develop new and innovative products which have local and international market potential.

The Division administers a $2.5 million Commercialization of Technology Program which provides financial assistance to private sector requests for the support of institutes, development of new products, commercialization of research, and feasibility studies.

The program assisted 34 organizations with a total commitment of over $ 2.4 million for the fiscal year.

Electronics/Microelectronics Section

The Electronics/Microelectronics Section is responsible for assisting Alberta's electronics industry in developing new products and incorporating new technologies in electronics and microelectronics products. The industry is well supported by Alberta's advanced technology infrastructure which includes "building block" facilities such as the Electronics Test Centre, the Alberta Microelectronic Centre and the Electronic Industry Information System.

Telecommunications Section

One of Alberta's technological strengths, due partly to the province's vast and varied geography, is an efficient and economical telecommunications system and an internationally-recognized telecommunications industry. This section assists companies develop telecommunications technology and products in the areas of voice, data, video, cellular radio, supervisory control and data acquisition, avionics, and satellite communications equipment.

Medical and Biological Sciences Section

The Medical and Biological Sciences Section assists with the development and commercialization of technologies that generate human health care products (drugs, vaccines, diagnostic agents) and agents used in new chemical, waste treatment, food processing and agricultural products. Biotechnology is a major stream of technology development within biomedical sciences.

Computing and Software Section

The Computing and Software Section is responsible for assisting Alberta's computer hardware, software and peripherals industry develop and commercialize new products and associated technologies. Developments of importance include high performance supercomputers, superminicomputers, parallel minisupercomputers, engineering workstations and related applications software, often involving artificial intelligence, expert systems, computer-aided design, drafting and engineering.

This section also cooperates with computing sector associations, including the Alberta Society of Software Developers, Canadian Information Processing Society, and the Edmonton and Calgary Advanced Technology Associations.

Advanced Materials and Processes Section

Advanced materials technologies offer ways to achieve technological lead and market advantage for Alberta companies. The Advanced Materials and Processes Section assists existing and new Alberta industries such as oil and gas, microelectronics, telecommunications, biotechnology, and computer and software, to use advanced materials and processes to increase market competitiveness.

The section also encourages the development of a provincial advanced materials manufacturing sector that will complement our traditional resource-based industry sectors.

Advanced Technologies - Manufacturing Section

The Advanced Technologies - Manufacturing Section concentrates its efforts on enhancing productivity and competitiveness of Alberta's existing manufacturing industries by the application of automated processes. It provides assistance and advice to Alberta's manufacturers on the use of advanced manufacturing technologies such as computer-aided design, computer-aided manufacturing and robotics.

The section also focuses on the development of research parks and special funding mechanisms which nurture start-up enterprises based on new technology.

Technology Transfer Section

Technology Transfer finds ways to commercialize inventions, technology know-how and technical information generated by agencies funded by the provincial government or private individuals. This includes working with technology transfer offices at the University of Alberta and the University of Calgary. This section is also involved in importing technology inventions for use by Alberta's industries.

Planning and Coordination Division

The Planning and Coordination Division provides research, advice and coordination in the ongoing development and administration of Alberta Government policy in both communications and science and technology.

The Division is responsible for long-term planning within the Department and assisting in the development of specific sectoral plans for advanced technology industries. It also provides technical, economic, financial and policy advice to support Departmental programs and other initiatives.

In addition, the Planning and Coordination Division provides support to the Minister in his responsibilities for the administration of the Alberta Research Council Act, Alberta Heritage Foundation for Medical Research Act, Alberta Educational Communications Corporation Act, Alberta Government Telephones Act and other telecommunications statutes.

The Division has administrative responsibility for the delivery of several programs including the Alberta-Heilongjiang Science and Technology Exchange Program and the Individual Line Service Program.

Telecommunications Policy

A meeting of Ministers of Communications was hosted in Edmonton on April 2 - 3, 1987. Priority items on the agenda were discussions concerning the appropriate roles and responsibilities of the provincial and federal governments in the development of national telecommunications policy and regulation, and the establishment of a common level of interconnection for telecommunications equipment and services across the country.

A Memorandum of Understanding by federal and provincial Ministers of Communications was signed at the meeting in Edmonton. Its highlights include:

- Recognition of federal responsibility for interprovincial and international telecommunications activities;
- Recognition of provincial responsibility for intraprovincial telecommunications activities including the terms and conditions of access to the local network;
- Agreement among Ministers to the interconnection of a broad range of telecommunications equipment and services and agreement to study the desirability of competition in public long distance services.

Broadcasting and Cable Television Policy

The Division continued to be active in providing policy advice on new federal government and industry initiatives in the field of broadcasting and cable television. Special attention was given to the licensing of new specialty television channels.

Distance Education

The Department was instrumental, with Advanced Education playing the lead role, in the establishment of the Canadian Distance Learning Development Centre. The Centre will research, develop, manufacture and market distance education products and services. Its aim is to serve the growing market for the delivery of educational and instructional services to learners who, because of location, do not have access to traditional educational institutions and training centres. The Centre will be operated by an industry/university/government consortium composed of AT&T Canada Inc., Alberta Government Telephones, Athabasca University, ACCESS NETWORK, and the Alberta Government.

Science and Technology Policy

With the signing of the National Science and Technology Policy on March 12, 1987, the Council of Science and Technology Ministers (CSTM) was formally established. The Council meets twice yearly to discuss matters of national concern related to science and technology. The Government of Alberta hosted the March 1988 meeting of the CSTM in Edmonton.

The Prime Minister's National Advisory Board for Science and Technology (NABST) held its regular meeting in Edmonton in February, 1988. Staff of the Planning and Coordination Division assisted the secretariat of NABST in arranging for events at which leaders of government, the universities and the private sector in Alberta met with the members of the Board.

Science and Technology Exchange Program

The first full year of operation of the Science and Technology Exchange Program was completed. The program involves a yearly reciprocal exchange of up to 10 scientific personnel from our Sister Province of Heilongjiang, People's Republic of China and from Alberta. During this reporting period the program sponsored exchanges in biotechnology, wildlife management, environmental technology, remote sensing and land-related information systems.

RADARSAT Project

Division personnel negotiated Alberta's participation in the RADARSAT project. RADARSAT is a Canadian-led international joint program to design, construct and operate Canada's first earth observation satellite system. Alberta's participation will include involvement in policy development and planning guidance on the domestic aspects of the program in matters relating to the acquisition, processing and distribution of RADARSAT data.

Industry Research

Development of the provincial database of technology-intensive enterprises (Altatech) advanced significantly during the reporting period. Now operational and capturing nearly 75 per cent of the Province's "high-tech" industrial community, Altatech has been used to satisfy data inquiries from a broad array of government agencies and private sector companies.

Individual Line Service Program

On September 11, 1987, the first rural residents received an individual telephone line replacing a party-line under the Individual Line Service Program (ILS). This was the start of the fulfillment of a commitment by the Government to replace all multi-party lines in Alberta with individual line service.

The five-year program will provide more than 100,000 telephone subscribers with private-line service throughout Alberta. Over 75 per cent of the cost of individual line service will be funded by the Government through the Alberta Heritage Savings Trust Fund.

As set by the Public Utilities Board, customers may choose to make a one-time only payment to Alberta Government Telephones of $560 or equivalent monthly payment of $5. In keeping with the Government's commitment to provide this universal service at $450, subscribers will receive a rebate of $110.

The Department is responsible for administering this program and is responsible for providing these rebates to customers after their lines have been converted. The program also refunds monthly service charges to rural customers who acquired private lines before the ILS program was implemented. As of March 31, 1988, there were approximately 9,000 conversions.

Financial Projects and Administration Division

Financial Projects and Administration provides analytical support, project appraisal and advice to the Department and Minister on financial aspects of projects sponsored by Technology, Research and Telecommunications. The Division provides legal and contract services to the Department, liaises with the Attorney General's Department, and is responsible for negotiating, drafting, and processing financial agreements and contracts. It also provides central support and financial advisory services to the Department.

The Division establishes and maintains accounting records and procedures and prepares the annual Departmental budget. It monitors expenditures and contracts with the private sector entered into by the Department.

Investment Development Division

The prime objective of the Investment Development Division is to promote and facilitate investment in Alberta's advanced technology sectors.

The Division develops and reinforces an awareness in the Canadian and international business communities of the Alberta Government's commitment to research, development and commercialization of leading-edge technologies.

It encourages investment in advanced technology development by promoting Alberta's programs, facilities and institutions.

Potential investors are identified and introduced to opportunities and prospective joint venture partners in Alberta, and the Division assists entry into the Alberta business community.

Human Resources Division

The Human Resources Division develops personnel systems and programs and provides consultant services to Departmental managers and staff. These programs consist of recruitment and selections, classification and compensation, employee relations, organizational design, human resources planning and pay and benefits administration.

Corporate and Public Relations Division

Corporate and Public Relations manages the flow of information concerning the issues and activities relevant to the Department's mandate. It designs and delivers promotional materials required by other divisions of the Department, and coordinates information dissemination on behalf of the Minister and the Department. Corporate and Public Relations also assists advanced technology "building block" facilities, institutions and organizations to increase the understanding of the Province's science and technology achievements and ambitions.

Budget Estimates and Expenditures Classified by Vote and Element

Vote 1	Development and Commercialization of Advanced Technologies	1987-88 Budget Estimates (includes special warrants)	Expenditures for the year ending March 31, 1988 (Unaudited)
1.0.1	Minister's Office	$ 220,911	$ 188,817
1.0.2	Deputy Minister's Office	180,910	171,004
1.0.3	Financial and Administrative Services	743,442	800,374
1.0.4	Research, Planning and Co-ordination	1,544,118	1,105,176
1.0.5	Technology Commercialization	957,517	871,736
1.0.6	Investment Development	405,494	537,979
1.0.7	Corporate and Public Relations	842,406	1,006,320
1.0.8	Human Resources	95,262	81,355
	TOTAL	**$ 4,990,060**	**$ 4,762,761**
Vote 2	**Financing of Technology and Research Project**		
2.0.1	Grants for Technology and Research Projects	$ 2,500,000	$ 2,436,200
2.0.2	Alberta Telecommunications Research Centre	772,940	772,940
2.0.3	Alberta Microelectronic Centre — Microchip Design and Fabrication	2,269,000	2,269,000
2.0.4	Alberta Microelectronic Centre — Computer Software	6,650,000	6,650,000
2.0.5	Supercomputer Centre	1,311,000	1,311,000
2.0.6	Alberta LASER Institute	1,000,000	1,000,000
2.0.7	Centre for Frontier Engineering Research	376,000	376,000
2.0.8	Advanced Materials and Processes	400,000	0
2.0.9	Satellite Receivers	-	-
2.0.10	Laser Technology	-	-
2.0.11	Computer Systems Development	500,000	500,000
2.0.12	Aerospace Technology	500,000	-
2.0.13	Spurt Investment Fund	500,000	252,001
2.0.14	Research Park Multi-Tenant Facilities	2,826,000	1,559,798
2.0.15	Advanced Genetics Research	3,500,000	3,500,000
2.0.16	Medical/Pharmaceutical	7,500,000	7,500,00
2.0.17	Telecommunications Technology	5,600,000	640,000
	TOTAL	**$36,204,940**	**$ 28,766,939**

Appendix I

Altatech

Altatech is a database designed to report on the "advanced" or "high" technology sector of Alberta's economy. It concentrates on the products/processes created by the application of science and technology and the local enterprises engaged in these activities. Altatech provides a profile of technology commercialization occurring in Alberta and its economic significance.

Currently, the database shows 755 technology-based enterprises. When the census is completed in fall '88 it is expected to grow to 1,000 firms. The information summarized below is based on the current data. Public inquiries about Altatech information are welcome. Please contact Technology, Research and Telecommunications, 12th floor, 10909 Jasper Avenue, phone (403) 422-0567.

Principal Products

The spectrum of products ranges from automation to transportation and the technical services necessary to the development and manufacture of such products. Note that the Altatech services are "value-added" activities, for example, process development, custom fabrication and testing, formation evaluation, and geographical analysis services. The Alberta universe of technology products and services is depicted in Table 1.

1. Technology Products and Services

Product array of Alberta's tech-intensive business by number of companies.

Automation	32 *	Computer Software	181
Biotechnology	12	Subassemblies	70
Chemical	48	Test & Measure	84
Computer Hardware	30	Telecom	28
Energy/Environment	79	Services	180
Materials	32	Other	10
Medical	21		
Photonics	15		
Transport	15		

* not additive, companies manufacture products that are classified in more than one product code.

Computing (hardware and software) and technical services account for half of the firms in Alberta. There is an overlap of companies engaged in manufacturing and services activities with about 245 companies not included in the services sector.

Size

The universe of Altatech contains divisions and subsidiaries of local and interprovincial corporations as well as independent companies. The size estimates reported here are based on 657 companies in order to eliminate duplication of the data and to represent their Alberta operations as accurately as possible.

Data on labour force, revenues, and R&D are collected using a range rather than an actual count. The estimates presented in tables 2 - 5 are based on the mid-points of the range. Note that the upper bound of each range is open; by using it, the estimates understate the totals. The R&D data were most frequently withheld, about 40% of the firms declined to report this information.

2.Total Work Force

Size	Number of Companies	(% of High-tech Companies)	Mid Point * Estimate
<4	187	(29)	374
5-9	149	(23)	1,043
10-19	98	(15)	1,470
20-49	99	(15)	3,465
50-49	54	(8)	4,050
100-249	31	(5)	5,425
250-499	25	(4)	9,375
500>	14	(2)	10,500
	657		35,702

* mid-point for upper range is 750.

Total employment in advanced technology businesses is estimated at 35,700. Table 2 shows the employment pattern of these industries. The firms that employ over 100 people represent a little over 10% of advanced technology enterprises. However, they account for 70% of the advanced technology labour force. The typical company is a small business with less than 20 employees but the typical employee works with more than 250 people.

The largest employers, companies with a work force of 500 or more, are in a variety of product sectors but tend to cluster in technical services and products related to the energy industry. Primary activities of these companies are process engineering services, petrochemical/chemical processing, and manufacture of instrumentation and equipment used in natural resource exploration and recovery.

3. R&D Work Force

Size	Number of Companies	(% of High-tech Companies)	Mid Point * Estimate
< 4	499	(76)	998
5-9	107	(16)	749
10-19	28	(4)	420
20-49	21	(3)	735
100 >	2	(1)	500
	657		3,452

* upper bound includes 2 ranges, mid-points are 175 and 375.

Virtually all companies in Altatech have active R&D programs and full-time research personnel. Aggregate R&D staff constitute 10% of the estimated total advanced technology labour force. Table 3 shows the R&D staffing pattern to be consistent with the total employment data. Small research groups are the prevailing tendency. Three out of four firms employ less than five full-time researchers.

As in the labour force, there are sector differences in R&D staffing. Among electronics firms, R&D staff constitute about 10% of the aggregate work force; in the computing sector 20% and in biotechnology 50% of sector work force.

4. Annual Revenues

Range	Number of Companies	(% of High-tech Companies)	Mid Point * Estimate ($000)	% of High-tech Revenues
< 1 million	349	(53)	174.5	4
$1 - 2.5	112	(17)	196	5
$2.5 - 5	67	(10)	251.25	6
$5 - 10	43	(7)	322.5	7
$10 - 25	48	(7)	840	20
$25 - 50	11	(2)	412.5	10
$50 million > *	27	(9)	2,025	48
	657		$4,221.75	

* mid-point for upper range is $75 million.

Total revenues of advanced technology businesses is estimated at $4.2 billion annually. The profile of company earning capacity in Table 4 demonstrates that the majority of the companies are small businesses. Two-thirds of the companies realize $2.5 million or less in annual resources; half earn under $1 million. The economic impact of the advanced technology community is attributable to the medium and large revenue generating firms, the 13% with revenues in excess of $10 million annually. The top 27 companies in revenues include a majority of the top employers, but not all. Analysis to date has shown no consistent correlation between labour force size and annual revenues.

5. R&D Expenditures

Range $	Number of Companies	(% of High-tech) Companies	Mid Point * Estimate ($000)
< 50K	294	(45)	7,350
50 - 100K	122	(19)	9,150
100-200K	121	(18)	18,150
200 - 400K	42	(6)	12,600
400K - 1,000K	34	(5)	23,800
1,000K >	44	(7)	66,000
	657		137,050

*mid-point of upper range is 1,500K.

Data on R&D expenditures are most affected by the under-reporting inherent in the upper boundary of the expenditure range, over $1 million. The estimates in Table 5 are rough indicators of the annual total expenditures on R&D.

Appendix II

Alberta Government Expenditures on Scientific Activities 1986-87

Total Government of Alberta expenditures on scientific activities increased to $329.4 million in 1986-87. As compared to total expenditures of $165.4 million five years earlier, this represents an average annual growth rate of 14.8 percent.

The $165.4 million total expenditures in 1981-82 constituted roughly 2.3 percent of the Province's budgetary revenues. The 1986-87 expenditures of $329.4 million represented nearly 4.6 percent of budgetary revenues.

1. Total Government of Alberta Expenditures on Scientific Activities (by performer)

Performer	FY 81/82 $ millions	FY86/87 $ millions	Average Annual Growth %
Intramural	53.5	83.5	9.3
Industry	43.0	91.3	16.3
University	22.9	91.2	31.8
Hospitals & Health Care	12.8	18.7	7.9
Alberta Research Council	27.8	33.8	4.7
Other	5.5	10.9	14.7
	165.4	329.4	14.8

Objectives of Expenditure

The Objectives served by the Government of Alberta's expenditures on scientific activities are reflected in Table 2.

Slightly over one-half of the Government's scientific expenditures in 1986-87 ($165.6 million) were in the energy and health fields. While constituting virtually the same proportion of total expenditures five years earlier, the annual growth rate in expenditures on health care has been more than double that of energy (21.3 percent vs 9.4 percent). As a consequence, health care has a larger share of the total science budget than energy.

2. Objectives of Provincial Government Expenditures on Scientific Activities

Objective	FY86-87 ($M) (% of Total)	FY 81-82* ($M) (% of Total)
Advancement of Science	10.1 (3.1)	8.0 (4.8)
Energy & Fuels	77.3 (23.5)	49.4 (29.9)
Environment	19.6 (6.0)	12.1 (7.3)
Health	88.3 (26.8)	33.6 (20.3)
Industry & Economic Development		
Agriculture	21.3 (6.5)	18.3 (11.1)
Fisheries	0.7 (0.2)	N/A (N/A)
Forestry	5.1 (1.5)	4.0 (2.4)
Manufacturing	55.6 (16.9)	16.1 (9.7)
Minerals	0.5 (0.2)	0.9 (0.5)
Other	6.2 (1.9)	N/A (N/A)
	89.5 (27.2)	39.3 (23.8)
Social Development	35.6 (10.8)	14.9 (9.0)
Other	9.0 (2.7)	8.1 (4.9)
	329.4 (100)	165.4 (100)

*reconstructed from the 1981-82 Statistics Canada survey.

Appendix III

Scientific Activities of the Government of Canada

Total federal government expenditures on scientific activities increased to $4,181.2 million in 1986/87. Compared to 1981/82 expenditures of $2,737.3 million, federal science funding averaged an annual growth rate of approximately nine percent. Science expenditures constitute roughly four percent of the total federal government expenditures for 1986/87 and 1981/82.

As shown in Table 1, 66 percent of the federal science agenda is executed intramurally. Universities and industry each perform about 14 percent of the dollar value of extramural expenditures of federal scientific activities. Local establishments of the federal government perform about 60 percent of all federally funded scientific activities in the province. A variation from the national pattern is the amount of extramural science activities performed by Alberta universities (28 percent). Local industries performed about 10 percent of federal science expenditures in Alberta, slightly less than the national expenditure pattern.

The thrust of federally funded science activities in Alberta for all performers is in the natural sciences and engineering fields which accounted for $155 million of the $166 million total. The local agencies that participated in the federal science activities in 1986/87 are described in the following tables: Table 2 portrays the intramural performers, Table 3 shows the main sources of funding to the university sector, and Table 4 tracks federally funded natural sciences R&D performed by Alberta industry.

1. Total Federal Expenditures on Scientific Activities, 1986/87 (by performer for Canada and Alberta)

Performing Sector	Canada	Alberta
	($ in millions)	
Intramural	2,761.7	101
Industry	574.8	16
University	603.3	46
Other Canadian	105.7	3
Foreign	135.7	–
Total	4,181.2	166

2. Intramural Science Expenditures of Federal Department Establishments in Alberta 1986/87

Department: Program	Expenditures		Science Staff	
	Total	R&D	Total	R&D Staff
	($ in millions)			
Agriculture:				
Forestry	7.0	5.8	93	83
Food Development	30.3	28.3	482	451
Administration	.2	–	6	–
(sub-total)	37.5	34.1	581	534
Energy, Mines & Resources:				
Minerals & Earth Sciences	20.6	18.0	211	167
Environment:				
Atmospheric Environment Services	9.2	–	230	–
Conservation & Protection	14.5	2.1	201	32
(sub-total)	23.7	2.1	431	32
Defense:				
Services	13.0	13.0	183	183
Stats Canada	5.2	–	69	–

3. Major Funders of University Performed Scientific Activities

Funder	1986/87	1981/82
	($ in millions)	
Medical Research Council	13	7
National Science and Engineering Research Council	25	16
Social Sciences and Humanities Research Council	1	2

4. Federally Funded Natural Sciences R&D Performed by Alberta Industry 1986/87

Source	Alberta	Total
	($ in millions)	
Grants		
Regional Industrial Expansion	3.3	202.3
National Research Council	3.4	65.0
Other	0.2	48.1
Sub-total	6.9	315.4
Contracts		
Defense	2.4	76.6
Supply & Services	0.6	13.3
National Research Council	—	23.6
Other	4.1	61.1
Sub-total	7.1	174.6
Total	14.0	490.0